

# High-Efficiency Power Amplifier for Over-the-Horizon Communications (HYPERION), Phase I

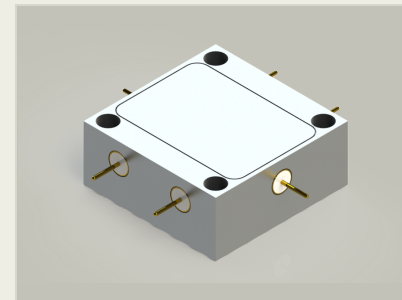
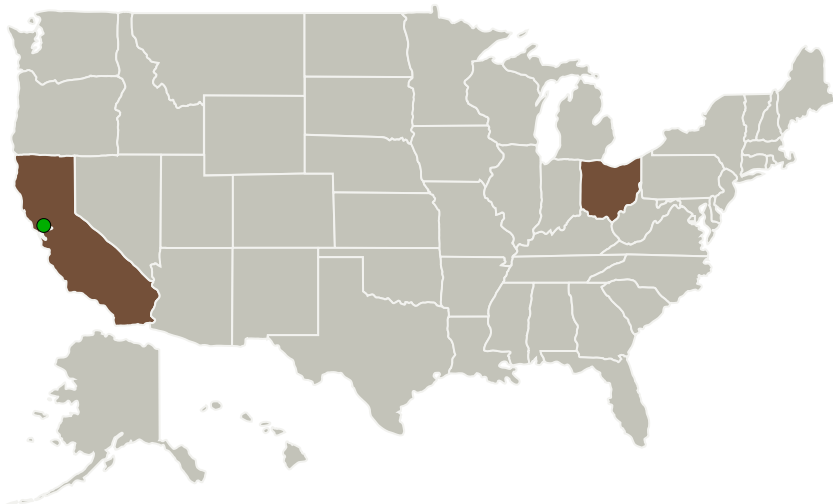
Completed Technology Project (2016 - 2016)



## Project Introduction

As unmanned aircraft system (UAS) technology continues to advance, the demand for over-the-horizon (OTH) communications links increases. Ku-band and Ka-band frequencies will be targeted for future OTH data links in support of NASA's Control and Non-Payload Communications (CNPC) program. Additionally, broadband-level data throughput is desired. NuWaves proposes the high efficiency ( $\geq 50\%$ ) HYPERION RF power amplifier (PA) monolithic microwave integrated circuit (MMIC) to provide the output power necessary to transfer data between the UAS and the satellite. The HYPERION PA utilizes a Doherty amplifier, maintaining high efficiency over a wide range of RF input power. This wide dynamic range can support a number of different waveforms, from constant-envelope waveforms (such as frequency shift keying (FSK) and binary phase shift keying (BPSK)) to more complex waveforms such as quadrature amplitude modulation (QAM). The HYPERION PA delivers a saturated output power of 25 W in Ku- and Ka-band variants, with 30 dB and 18 dB of small signal gain, respectively.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Nu Waves Ltd.	Lead Organization	Industry	Middletown, Ohio
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

## Primary U.S. Work Locations

California	Ohio
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## Project Transitions

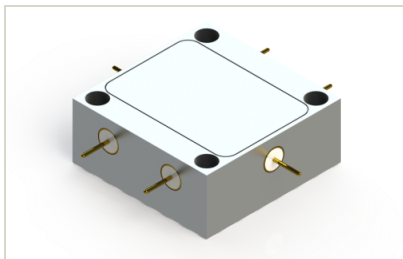
▶ **June 2016:** Project Start

✓ **December 2016:** Closed out

### Closeout Documentation:

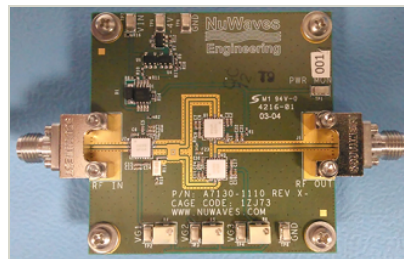
- Final Summary Chart(<https://techport.nasa.gov/file/140496>)

## Images



### Briefing Chart Image

High-Efficiency Power Amplifier for Over-the-Horizon Communications (HYPERION), Phase I  
(<https://techport.nasa.gov/image/135215>)



### Final Summary Chart Image

High-Efficiency Power Amplifier for Over-the-Horizon Communications (HYPERION), Phase I Project Image  
(<https://techport.nasa.gov/image/131409>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Nu Waves Ltd.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

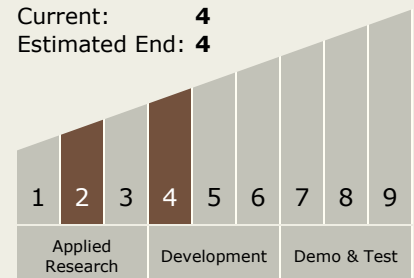
Carlos Torrez

### Principal Investigator:

Dustin Brown

## Technology Maturity (TRL)

Start: 2  
Current: 4  
Estimated End: 4



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## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.2 Radio Frequency
    - └ TX05.2.2 Power-Efficiency

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System